

299-W15-80 (A7381) Log Data Report

Borehole Information:

| | | | | | |
|-------------------------------------|--------------|------------------------------------|----------------------------------|-------------------------|-------------|
| Borehole: 299-W15-80 (A7381) | | Site: 216-T-21 Trench | | | |
| Coordinates (WA State Plane) | | GWL (ft)¹: 165.8 | GWL Date: 12/17/2002 | | |
| North | East | Drill Date | TOC² Elevation | Total Depth (ft) | Type |
| 136,108.07 m | 566,548.97 m | Oct. 1953 | 207.934 m | 167 | Cable Tool |

Casing Information:

| Casing Type | Stickup (ft) | Outer Diameter (in.) | Inside Diameter (in.) | Thickness (in.) | Top (ft) | Bottom (ft) |
|---|--------------|----------------------|-----------------------|-----------------|----------|------------------|
| Welded steel | 3.75 | 6 5/8 | 6 | 5/16 | +3.75 | N/A ³ |
| The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The inside casing diameter was measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. | | | | | | |

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS⁴, and Chamness and Merz (1993). The logging engineer measured the depth-to-water and depth-to-bottom reported above. Zero reference is the top of the 6-in. casing. Top of casing is unevenly cut. A reference point survey "X" is located on top of the casing stickup. According to Chamness and Merz (1993), the borehole was deepened in November 1982, and 6-in. casing was installed and grouted. The original casing was 8 in.

Logging Equipment Information:

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|--|--|
| Logging System: Gamma 2A | Type: SGLS (35%) |
| Calibration Date: 10/2002 | Calibration Reference: GJO-2002-383-TAC |
| Logging Procedure: MAC-HGLP 1.6.5, Rev. 0 | |

Spectral Gamma Logging System (SGLS) Log Run Information:

| Log Run | 1 | 2 | 3/Repeat | | |
|-------------------|------------------|----------|----------|--|--|
| Date | 12/17/02 | 12/18/02 | 12/18/02 | | |
| Logging Engineer | Spatz | Spatz | Spatz | | |
| Start Depth (ft) | 167.5 | 36.5 | 47.5 | | |
| Finish Depth (ft) | 35.5 | 4.5 | 31.5 | | |
| Count Time (sec) | 100 | 100 | 100 | | |
| Live/Real | R | R | R | | |
| Shield (Y/N) | N | N | N | | |
| MSA Interval (ft) | 1.0 | 1.0 | 1.0 | | |
| ft/min | n/a ⁵ | n/a | n/a | | |

| Log Run | 1 | 2 | 3/Repeat | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| Pre-Verification | BA176CAB | BA177CAB | BA177CAB | | |
| Start File | BA176000 | BA177000 | BA177033 | | |
| Finish File | BA176132 | BA177032 | BA177049 | | |
| Post-Verification | BA176CAA | BA178CAA | BA178CAA | | |
| Depth Return Error (in.) | 0 | n/a | -1.5 | | |
| Comments | No fine-gain adjustment. | No fine-gain adjustment. | No fine-gain adjustment. | | |

Logging Operation Notes:

Zero reference was top of the 6-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 082. During SGLS logging, fine-gain adjustments were not needed to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel.

Analysis Notes:

| | | | | | |
|-----------------|---------|--------------|----------|-------------------|------------------------|
| Analyst: | Sobczyk | Date: | 01/02/03 | Reference: | GJO-HGLP 1.6.3, Rev. 0 |
|-----------------|---------|--------------|----------|-------------------|------------------------|

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits except for file BA176CAA. File BA176CAA (logging run 1) was above the control limit for the 2615-keV full-width at half-maximum value. Examinations of spectra indicate that the detector appears to have functioned normally during logging run 1, and the spectra are accepted. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were generally lower and between 1 and 7 percent lower at the end of each day.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2AOct02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 6-in. casing. The casing configuration was assumed to be one string of 6-in. casing to total depth (167.5 ft). The casing correction factor was calculated assuming a casing thickness of 5/16 (0.313) in. This casing thickness is based upon the field measurement. A water correction was applied to the SGLS data below 165.8 ft. Dead time corrections are required when dead time exceeds 10.5 percent. As the dead time did not exceed 10.5 percent, a dead time correction was not needed or applied.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

¹³⁷Cs was the only man-made radionuclide detected in this borehole. ¹³⁷Cs was detected in the borehole near the ground surface with a concentration of 0.3 pCi/g at a log depth of 4.5 ft. ¹³⁷Cs was detected in the interval from 38.5 ft through 40.5 ft. The range of concentrations was from 1.8 pCi/g to 6 pCi/g, with the maximum concentration detected at 39.5 ft. ¹³⁷Cs was also detected at 143.5 and 97.5 ft with concentrations between 0.2 pCi/g and 0.3 pCi/g.

It is likely that gamma emissions from undisturbed sediments are only marginally detected by the SGLS. Due to the method of well completion, SGLS results in this borehole may not reflect the distribution of the natural or man-made radionuclides in the formation. The presence of an annulus filled with grout around the casing greatly attenuates gamma rays originating in the surrounding formation. Results from this borehole may not reflect actual concentrations in the formation and should be used with caution.

Given the counting times and casing thickness, the plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and natural radionuclides (661, 609, 1461, 1764, and 2614 keV).

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

¹ GWL – groundwater depth

² TOC – top of casing

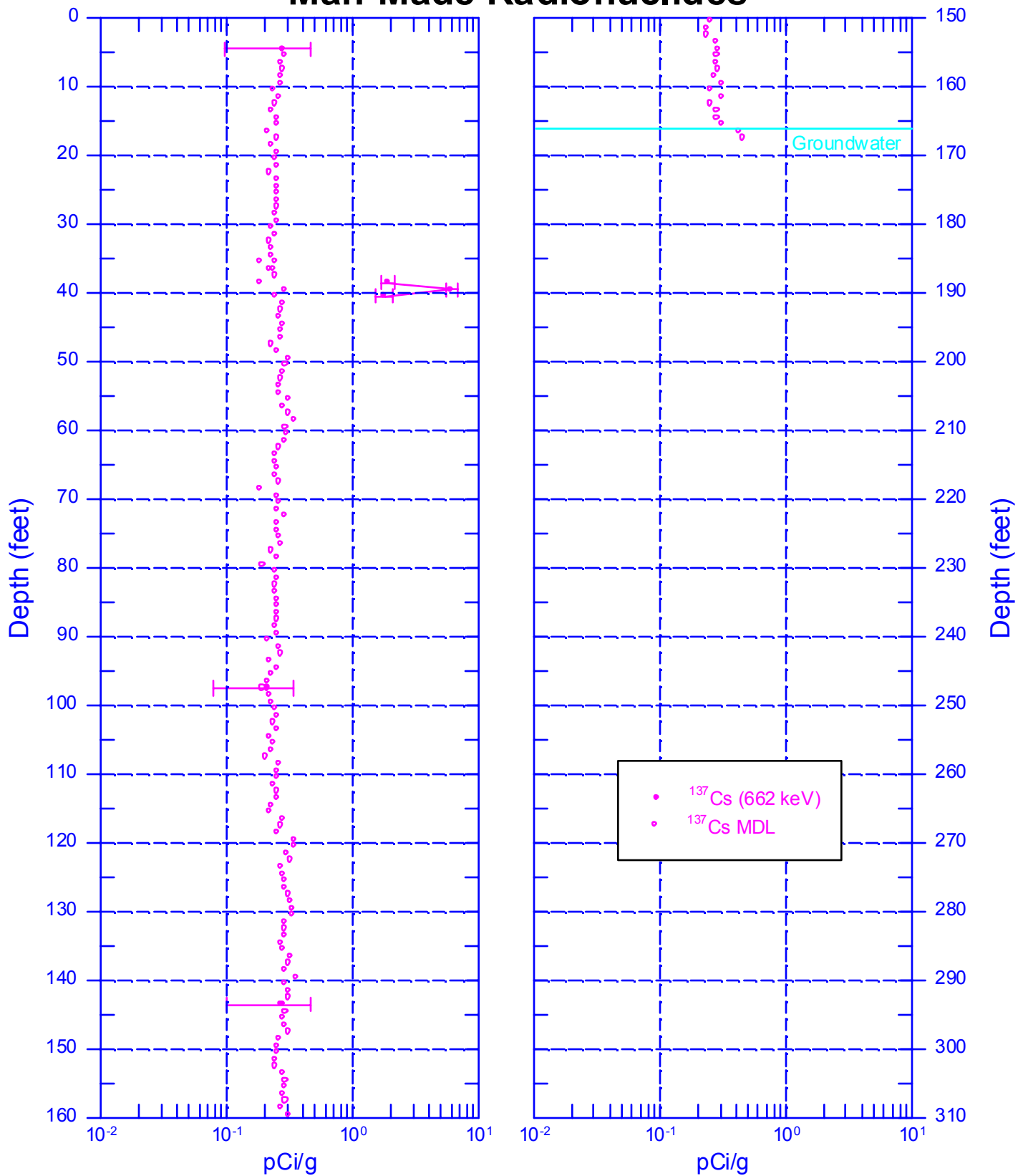
³ N/A – not available

⁴ HWIS – Hanford Well Information System

⁵ n/a – not applicable

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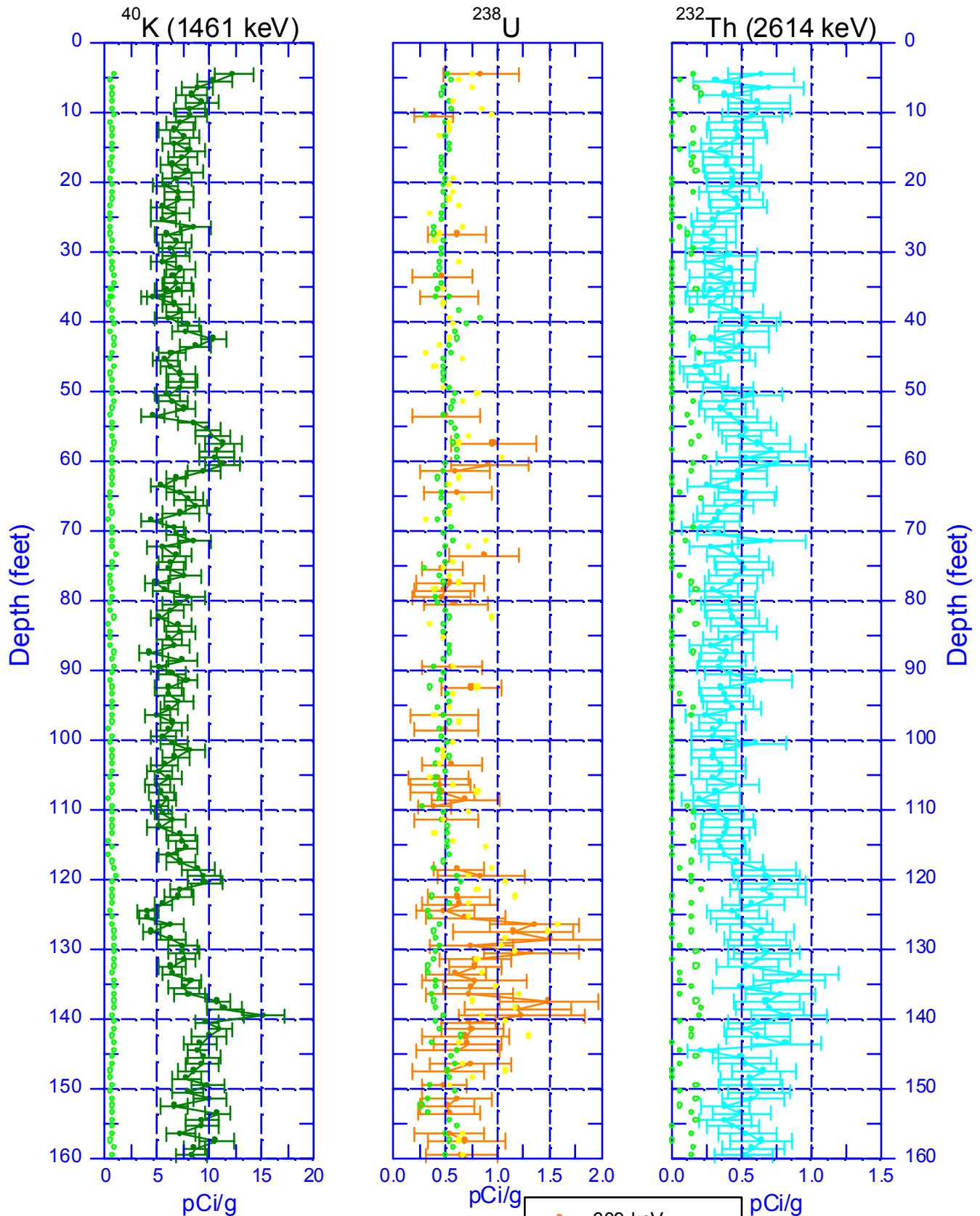
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
12/18/2002

299-W15-80 (A7381) Natural Gamma Logs



MDL

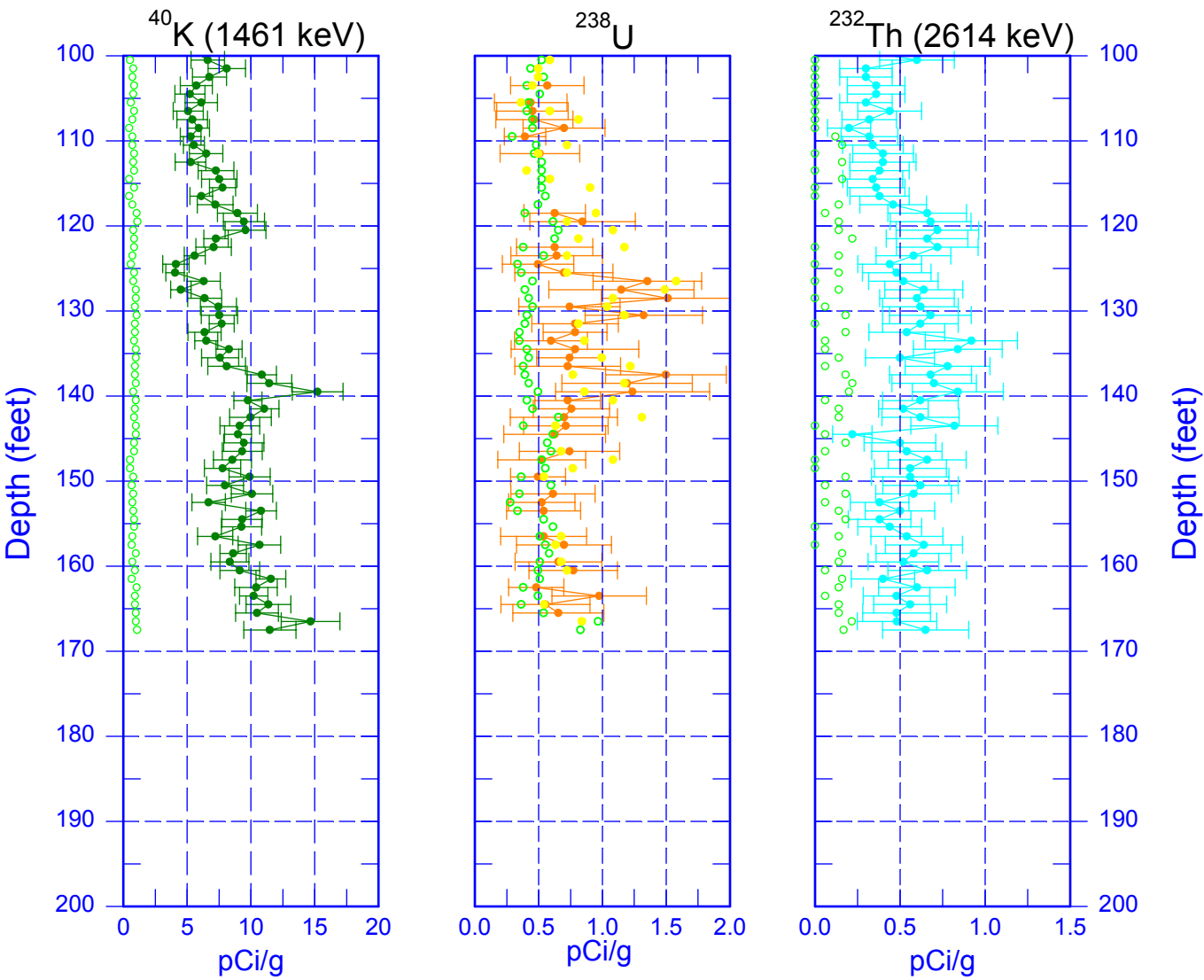
Zero Reference = Top of Casing

- 609 keV
- MDL (609 keV)
- 1764 keV

Date of Last Logging Run
12/18/2002

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Natural Gamma Logs



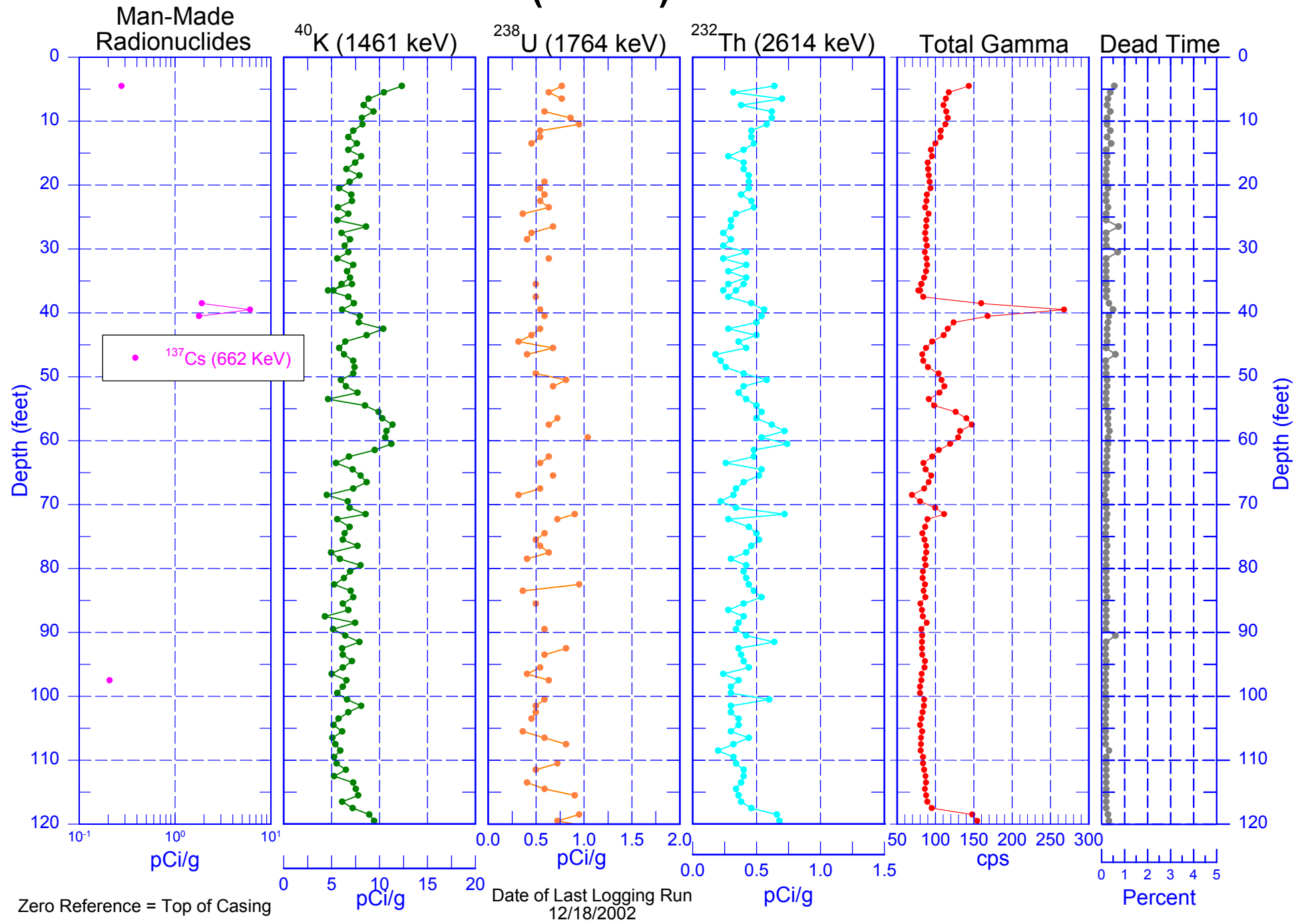
○ MDL

Zero Reference = Top of Casing

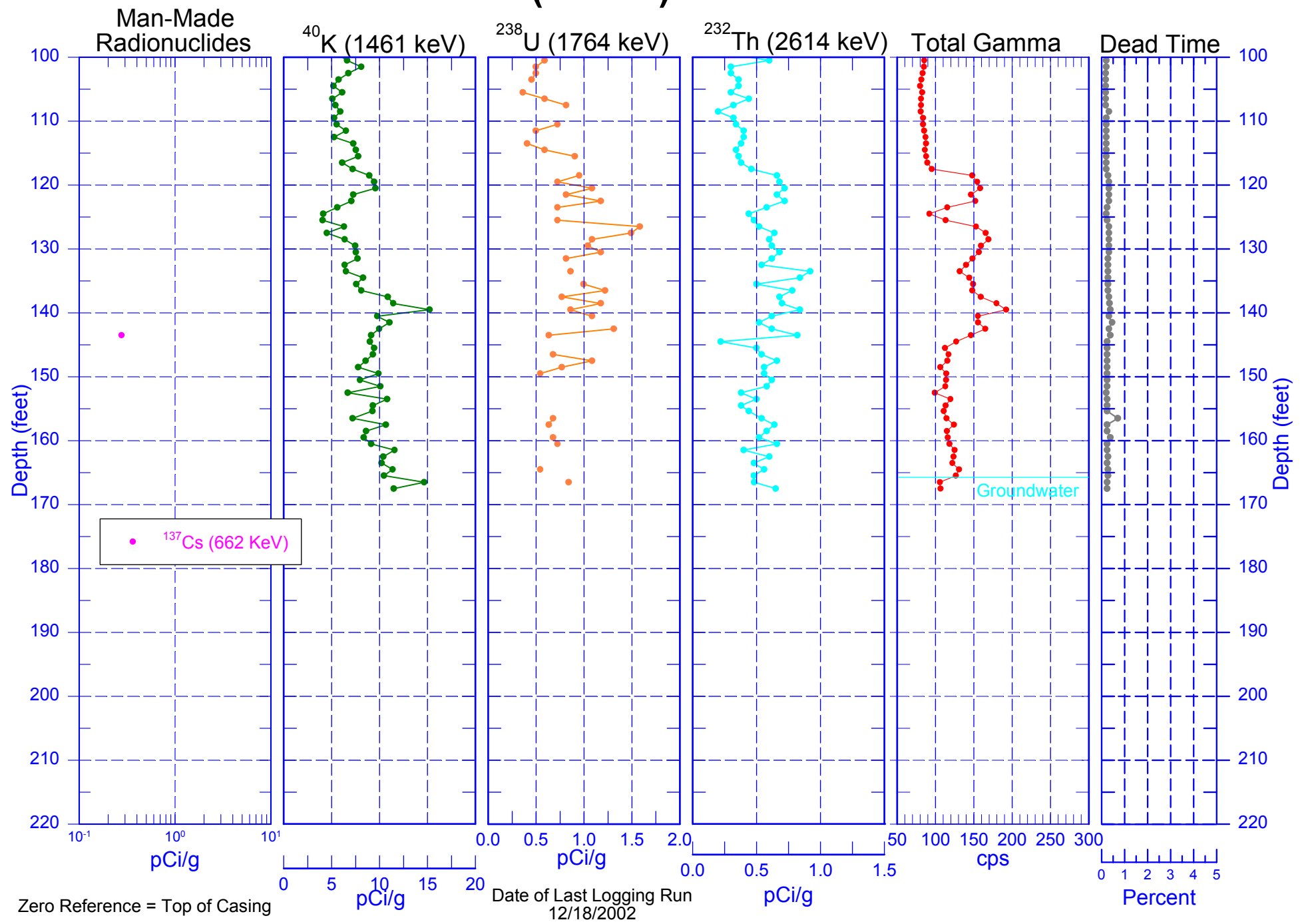
- 609 keV
- MDL (609 keV)
- 1764 keV

Date of Last Logging Run
12/18/2002

299-W15-80 (A7381) Combination Plot

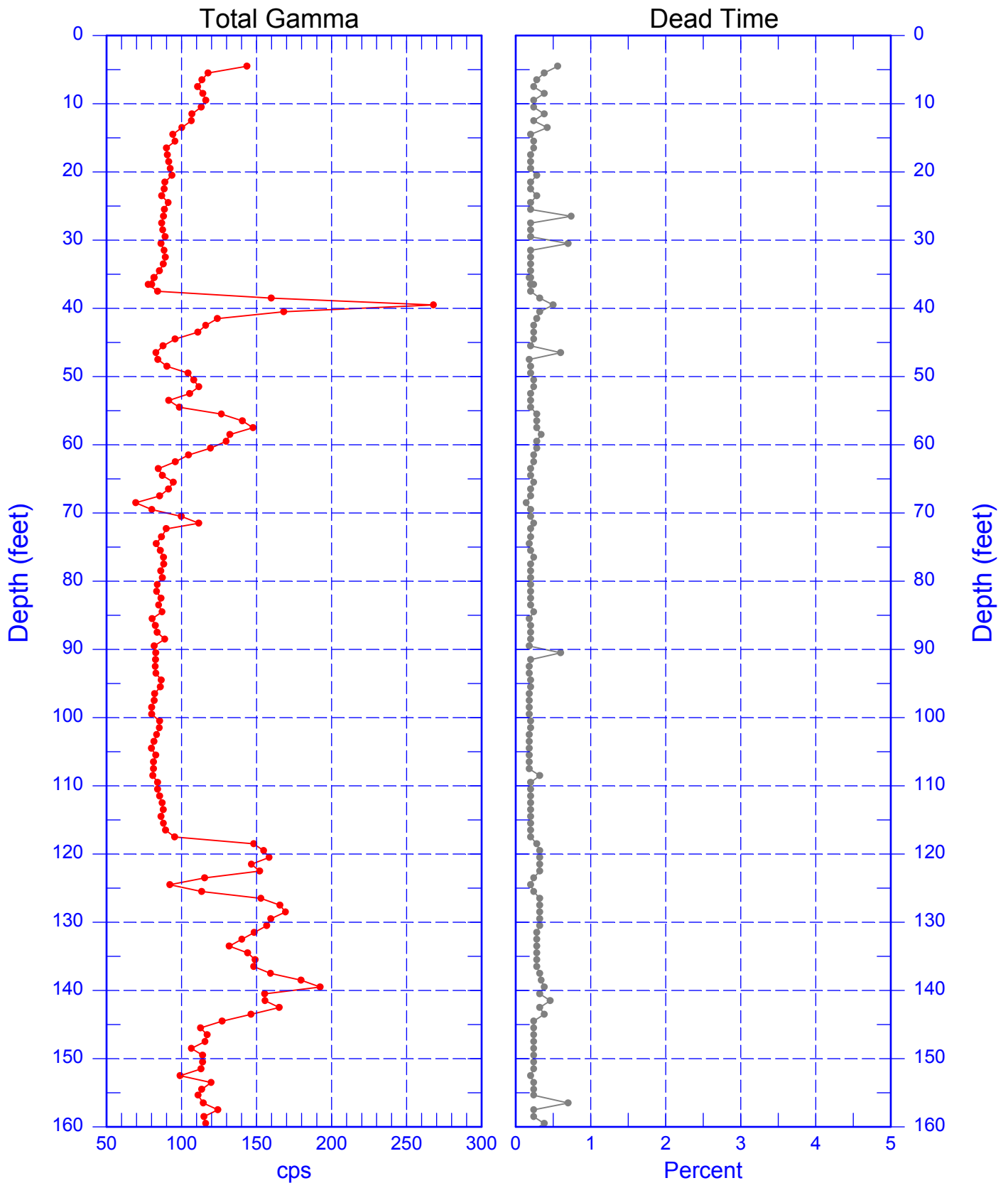


299-W15-80 (A7381) Combination Plot



299-W15-80 (A7381)

Total Gamma & Dead Time

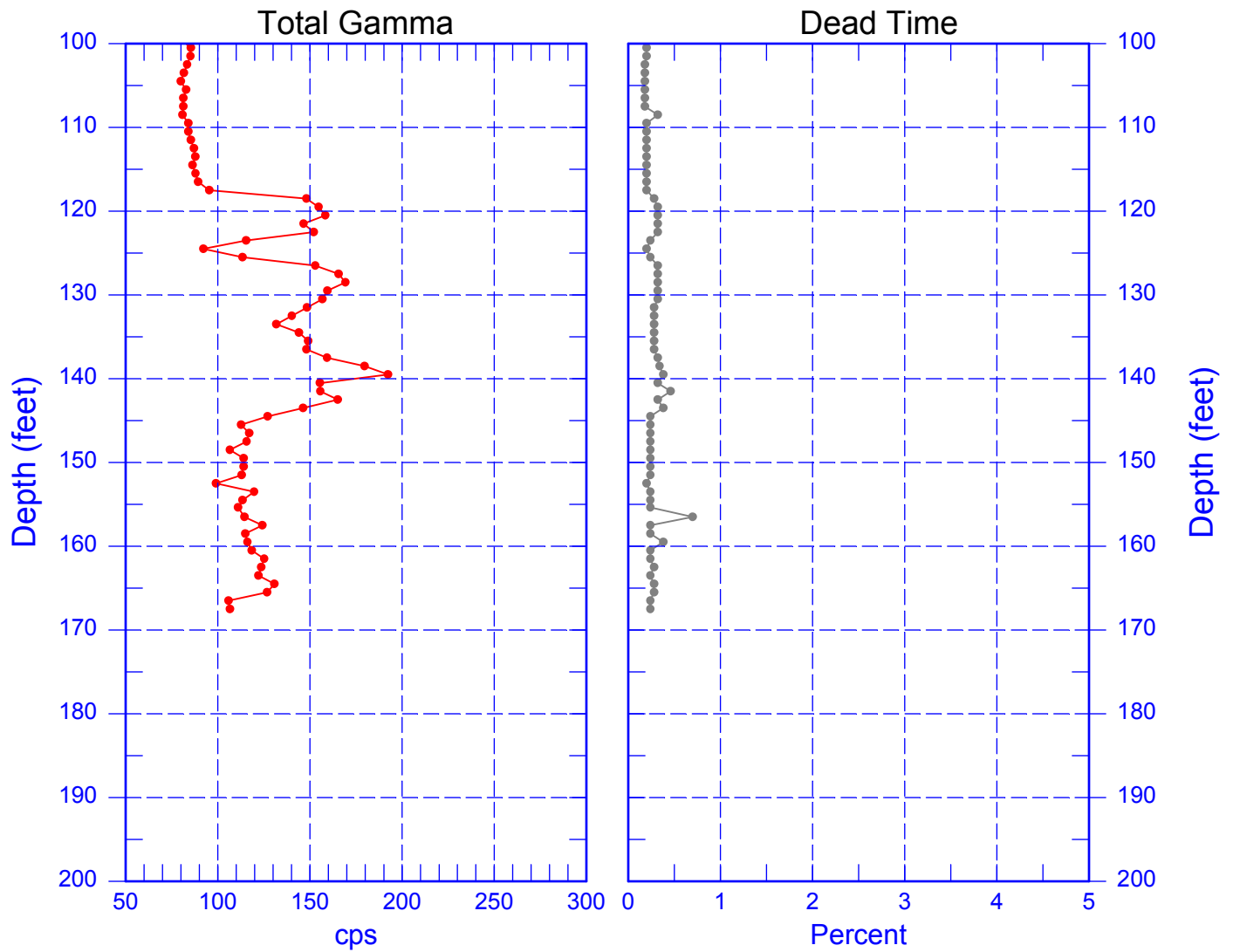


Zero Reference = Top of Casing

Date of Last Logging Run
12/18/2002

299-W15-80 (A7381)

Total Gamma & Dead Time

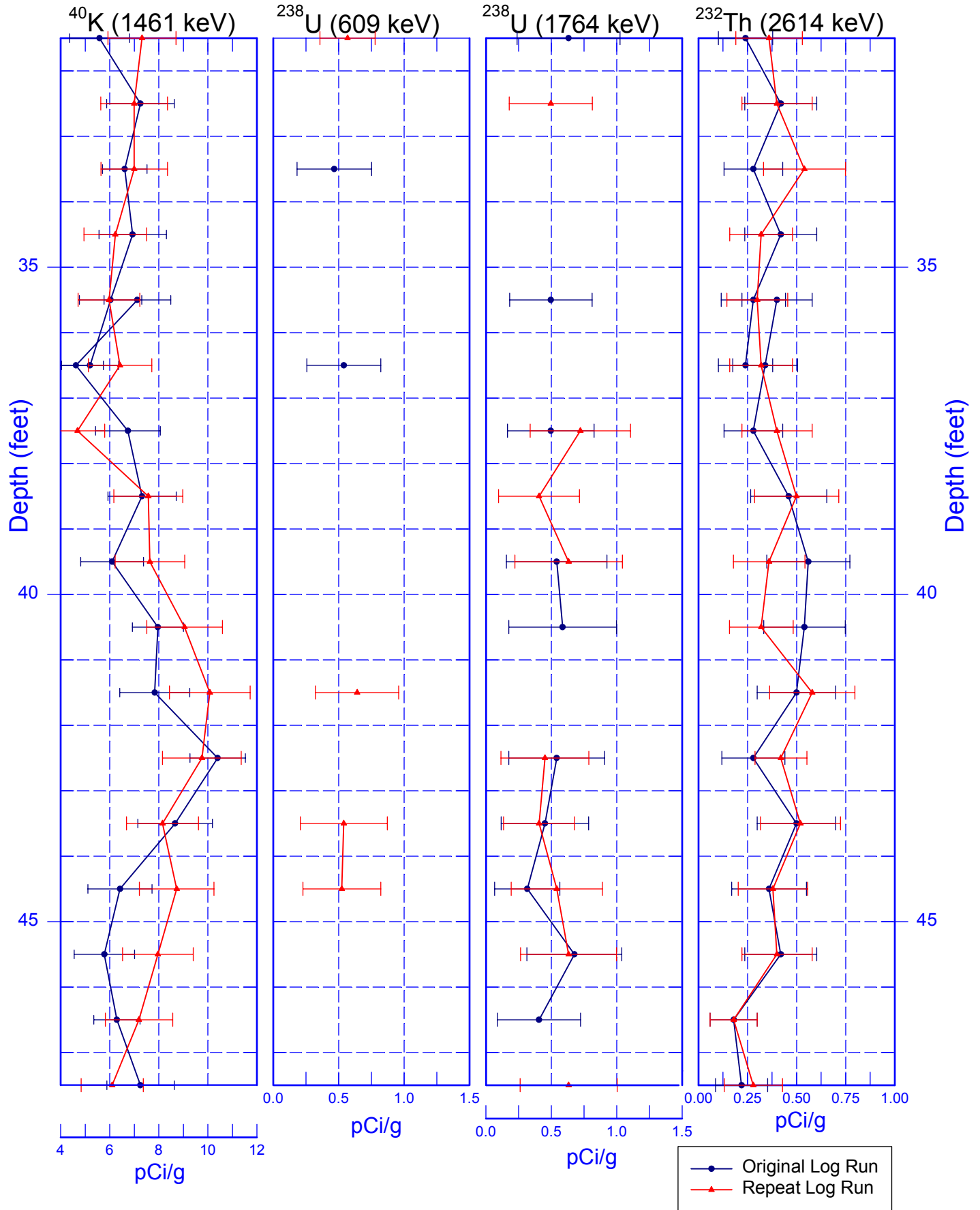


Zero Reference = Top of Casing

Date of Last Logging Run
12/18/2002

299-W15-80 (A7381)

Rerun of Natural Gamma Logs (47.5 to 31.5 ft)



299-W15-80 (A7381)

Rerun of Man-Made Radionuclides (47.5 to 31.5 ft)

